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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,007	04/16/2004	Hongxing Tang	CIT.PAU.46	9207
22428	7590	04/10/2006		
FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			EXAMINER BONANTO, GEORGE P	
			ART UNIT 2855	PAPER NUMBER

DATE MAILED: 04/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/826,007	<b>Applicant(s)</b> TANG ET AL.	
	<b>Examiner</b> George P. Bonanto	<b>Art Unit</b> 2855	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 March 2006.  
 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 39-60 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 39-60 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on 11/01/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 39, 43-50, and 53-59 are rejected under 35 U.S.C. 102(b) as being anticipated by “Thin gold film strain gauges” by Li et al.

As to claim 39, Li et al disclose a device comprising a cantilever (cantilever beam; Fig. 2) a metal thin film piezoresistor located on the cantilever (strain gauge; Fig. 2) and a detector which is adapted to measure a resistance change in the piezoresistor in response to a force applied to the cantilever (LCR meter; Fig. 2).

As to claim 43, Li et al. further disclose that the cantilever comprises an inorganic material cantilever (silicon dioxide coated wafer; abstract).

As to claim 44, Li et al. further disclose that the cantilever comprises an insulating inorganic cantilever (silicon dioxide coated wafer; abstract).

As to claim 45, Li et al. further disclose that the cantilever comprises a silicon nitride, a silicon oxynitride or a silicon oxide cantilever (oxide grown on silicon wafer; page 813).

As to claim 46, Li et al. further disclose that the cantilever comprises a semiconductor cantilever (silicon wafer; page 813).

As to claim 47, Li et al. further disclose that the thin metal film comprises a pure metal composition selected from the group consisting of Au, Cr, Ag, Pd, Ni, Pt, or Mn, or alloys selected from the group consisting of Au-Ni, NiCr, Bi-Sb, Ag-Ni, Cu-Ni, or Pt-Cr (introduction; page 813).

As to claim 48, Li et al. further disclose that the thin metal film is located on a surface of the cantilever (Fig. 2).

As to claim 49, Li et al. further discloses that the thin metal film comprises a film with a thickness on the order of tens of angstroms or less (gold layer of 30 and 60 angstroms; page 813).

As to claim 50, Li et al. disclose a measurement method comprising providing a cantilever and a metal thin film piezoresistor located on the cantilever (thin gold film strain gauge on cantilever beam; Fig. 2) stressing the cantilever with a force having a transverse component (force; Fig. 2 and page 813) and measuring a resistance change in the piezoresistor in response to the transverse component of the force applied to the cantilever (experimental method section; pages 813-814).

As to claim 53, Li et al. further disclose that the cantilever comprises an inorganic material cantilever (silicon dioxide coated wafer; abstract).

As to claim 54, Li et al. further disclose that the cantilever comprises an insulating inorganic cantilever (silicon dioxide coated wafer; abstract).

As to claim 55, Li et al. further disclose that the cantilever comprises a silicon nitride, a silicon oxynitride or a silicon oxide cantilever (oxide grown on silicon wafer; page 813).

Tortonese et al. disclose a cantilever that comprises a notched nanocantilever (Fig. 2a) and a piezoresistor located on arm portions of the nanocantilever adjacent the notch (Fig. 2a).

It would have been obvious to one of ordinary skill in the art to modify the sensor of Li et al. by using the notched nanocantilever and piezoresistor placement of Tortonese et al. in order to expose the piezoresistor to a greater strain for a given force, increasing sensitivity.

Claims 41, 42, 51, and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Thin gold film strain gauges" by Li et al., as applied to claims 39 and 50 above, in view of "Polymer-based stress sensor with integrated readout" by Thaysen et al.

As to claims 41 and 51, Li et al. disclose that the thin metal film piezoresistor is located adjacent to a base of the cantilever (Fig. 2) but fail to explicitly disclose that the cantilever comprises a biofunctionalized cantilever and the detector is adapted to detect binding of a biological analyte to the cantilever.

Thaysen et al. disclose a biofunctionalized cantilever that is adapted to detect the binding of a biological analyte to the cantilever (page 1, col. 2, first full paragraph).

It would have been obvious to one of ordinary skill in the art to modify the device of Li et al. by including the biofunctionalized cantilever of Thaysen et al. in order to be able to detect when molecules are immobilized onto the surface of the cantilever (Thaysen et al.; page 1, col. 2, first full paragraph).

As to claims 42 and 52, Li et al. further disclose that the detector is adapted to detect stress in the cantilever (experimental method; pages 813-814) and Thaysen et al. further disclose that the binding of the analyte to the cantilever causes stress which is detected by the piezoresistor (theory; page 2698).

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As to claim 56, Li et al. further disclose that the cantilever comprises a semiconductor cantilever (silicon wafer; page 813).

As to claim 57, Li et al. further disclose that the thin metal film comprises a pure metal composition selected from the group consisting of Au, Cr, Ag, Pd, Ni, Pt, or Mn, or alloys selected from the group consisting of Au-Ni, NiCr, Bi-Sb, Ag-Ni, Cu-Ni, or Pt-Cr (introduction; page 813).

As to claim 58, Li et al. further disclose that the thin metal film is located on a surface of the cantilever (Fig. 2).

As to claim 59, Li et al. further discloses that the thin metal film comprises a film with a thickness on the order of tens of angstroms or less (gold layer of 30 and 60 angstroms; page 813).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 40 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Thin gold film strain gauges” by Li et al., as applied to claims 39 and 50 above, in view of “Atomic resolution with an atomic force microscope using piezoresistive detection” by Tortonesi et al.

As to claims 40 and 60, Li et al. fail to explicitly disclose that the cantilever comprises a notched nanocantilever and the metal thin film piezoresistor is located on arm portions of the nanocantilever.

***Response to Arguments***

Applicant's arguments with respect to claims 39-41 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Nos. 4,798,206 and 6,006,606 and Published U.S. Application Nos. 2002/0174715 and 2002/0178801 disclose various piezoresistive sensors.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George P. Bonanto whose telephone number is (571) 272-2182. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GPB  
5 April 2006

  
**EDWARD LEFKOWITZ**  
**SUPERVISORY PATENT EXAMINER**  
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